

Environmental Influences on Key Species and Ecosystems in Suisun Marsh

Susan L Ustin

Public Comments

No public comments were received for this proposal.

Initial Selection Panel Review

Proposal Title

#0021: Environmental Influences on Key Species and Ecosystems in Suisun Marsh

Funding:

Do not fund

Initial Selection Panel (Primary) Review

Topic Areas

- Environmental Influences On Key Species And Ecosystems
- Direct And Indirect Effects Of Diversions On At-risk Species
- Implications Of Future Change On Regional Hydrology, Water Operations, And Environmental Processes
- Water Management Models For Prediction, Optimization, And Strategic Assessments
- Assessment And Monitoring

Please describe the relevance and strategic importance of this proposal in the context of this PSP. How does the proposal address the topic areas identified above? What are the broader CALFED Goals this proposal may meet that are not accounted for in these specific topic areas?

This proposal makes use of remote sensing in the Delta and Suisun Marsh to create a means for relating water use and management with the plant community function and response. The products from the work would contribute to environmental influence assessment, implications for future change, water management, and less directly to effects of diversions and to assessment and monitoring. The remote sensing has been done and will be combined with historic record to create models that can be used to predict plant composition under future conditions. The probabilistic answers can be very helpful to decision makers. Reviewers identify issues that make the work both challenging and potentially powerful.

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Initial Selection Panel Review

The budgets of proposals submitted in response to this PSP are larger, on average, than those submitted to CALFED in previous years. The Science Program is committed to getting as much science per dollar as is reasonably possible. With this commitment in mind, can the proposed budget be streamlined? If so, please recommend and clearly justify a new budget total in the space provided.

The budget actually seems quite modest for the scope of the project.

Evaluation Summary And Rating.

Provide a brief explanation of your summary rating and any additional comments you feel are pertinent.

This is an interesting use of remote sensing, ground truth, and historical data. It has the potential to provide very useful input to decision making via scenarios for the future and assessment of past practice. The methods to be used are well defined and the project team is experienced in both marsh study and the use of remote sensing. The probability is high that the work can be completed as proposed. The project seems directly related to elements of two broad priority areas, viz., ecological processes/water management and performance assessment to evaluate future changes, as well as to 4 or 5 topic areas listed above.

Selection Panel (Discussion) Review

fund this amount: \$0

note:

do not fund

The project proposes to tackle a number of items relevant to CALFED in Suisun Marsh using remote sensing. They have already collected remote data and some historical data. The next, more difficult tasks are to take the remote sensory and historical data, correlate them, and incorporate these correlations into a predictive model. It was not clear to the panel whether the team can turn the historical information into a predictive tool, but if they are successful it would be a high payoff.

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Initial Selection Panel Review

This effort considers what is there now and what was there in the past. But planning for substantial restoration efforts is underway. Could this model be applied to look at sustainability of those restoration alternatives? It appears from the proposal that this would be difficult.

In addition, DWR, DFG, FWS, and the Suisun Resource Conservation District are currently doing a lot of work in Suisun Marsh to develop conceptual models, including using a 30 year data set. They have also recently re-done all the elevations in the marsh for a new base map. If this proposal could take the agency work to the next step it would be very useful, and the agencies would be very interested in working with them. However, other panelists voiced concern that the project proponents did not do their homework and did not realize that the agency work is ongoing.

Ultimately, there was concern that the model only correlates historical data with historical changes and doesn't address mechanisms. Because of this, and the other concerns listed above, the panel decided not to fund this proposal.

Panel Ranking: Do not fund

Technical Synthesis Panel Review

Proposal Title

#0021: Environmental Influences on Key Species and Ecosystems in Suisun Marsh

Final Panel Rating
above average

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

Dr. Ustin submitted a very interesting proposal to use hyperspectral remote sensing images along with multivariate statistical methods to determine the physical controls on species composition in the Suisun Marsh. The methodology appears to be generally sound, especially for relating species composition to (time-invariant) natural landscape variables. The applicants may encounter difficulties using time varying hydroclimate variables to construct the CART model as the time scale of hydroclimate variability is likely to differ from the time scale of vegetation change. However, such difficulties provide justification for embarking on the research! The proposed research has potential to provide very useful information on the effects of management actions on Suisun Marsh ecosystems. The main comments from the external reviewers were: (1) The "what-if" scenarios may be outside of the range of the data used to train the statistical model; (2) the team may not understand the dynamic nature of coastal marshes, especially salinity; and (3) it may be difficult to correlate changes in vegetation to specific management or hydrologic changes that have occurred in the past

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Additional Comments:

1. The applicants mention the use of generalized additive models if the CART model fails (but the applicants do not describe criteria for model failure). I suggest implementing GAM regardless of the results obtained from CART (or some type of multivariate logistic regression model), and comparing results with CART. The regression framework may offer some important advantages as it does not require specifying thresholds for each of the predictor variables. 2. The applicants do not discuss methods for model verification. Since the applicants are estimating probabilities, Bayesian model verification methods are most appropriate (e.g., the conditional probability of estimates for cases where the observation is one; the conditional probability of observations for different estimated probability categories). These methods are discussed in the meteorology literature, for example, Wilks (1995) *Statistical Methods in the Atmospheric Sciences* [Chapter 7].

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Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

The panel concluded that this proposal is do-able in Suisun Marsh, the team is capable of performing the proposed work, and the study is likely to produce useful products. The panel had a significant concern regarding how salinity and flooding will be related to plant species composition if an adequate DEM (Digital Evaluation Model) is not available. The proposal also would have been stronger if it contained additional detail regarding standards for model success or failure.

Technical Review #1

proposal title: Environmental Influences on Key Species and Ecosystems in Suisun Marsh

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	The goal of this proposal is to use a classification and regression tree (CART) model to predict the location of and compositional changes in wetland and aquatic plant communities of Suisun Marsh in response to potential climatic and anthropogenic changes in the hydrologic regime using remotely sensed data. This project relates to two topic areas of the PSP (ecological process in relation to water mgt and key species, improve management tools and future changes). The research questions are clearly stated and timely given current understanding and recent advances in image analysis techniques and statistical analysis.
Rating	excellent

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Comments	The study is justified because it provides an analysis of the relationship between a number of physical and anthropogenic factors and plant community response distributed across space. Although the conceptual model underlying this type of relationship is relatively simple, the interactions of factors across space in real landscapes can often be dizzyingly
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Technical Review #1

	complex. The type of research described here is an important analytical tool for teasing apart such interactions to support decision-makers. It will probably not provide a definitive answer to every proposed research question, but it will provide probabilistic expectations that are a very good initial step forward.
Rating	excellent

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	I think the approach to image classification and historical analysis is top-notch. CART analysis is indeed a powerful tool, but it has some of the same draw-backs as other multivariate correlative techniques (e.g., step-wise regression). At any level in the classification tree, the variable selected for dividing the sample population may have only slightly more explanatory power than a close surrogate. In cases such as this, where many physical variables are driven by the hydrologic regime, it is possible for a variable to be passed over in favor of a close correlate (or causal descendant) that does an incrementally better job explaining variation in the response variable due to spurious correlation. This selection can sometimes change the nature of the lower branches dramatically. I think there are boot-strapping techniques in development or already available to help address this issue (e.g., Random Forests) that are distinct from the normal cross-validation techniques. Since the onus for this interpretation awareness
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Technical Review #1

	falls on the investigator, it would be nice to see this kind of thing explicitly mentioned in the proposal, especially since the results are going to be relied upon for forecasting. Otherwise, I think the technique is feasible and likely to result in some interesting findings that may provide useful information for decision-makers.
Rating	very good

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success?
Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	Certainly the image classification and environmental analysis portion of the project is well-documented, technically feasible, and well within the grasp of the investigators. I found myself a bit concerned by the documentation of the "what if" scenarios under future climate shifts or management actions and how they will be translated into predictions. This seemed kind of vague in the proposal and perhaps that is to be expected at this stage. However, it would be nice to know more about how the scenarios will be incorporated into distributed predictions, especially if future climate, management action, or their interactions fall well outside the range of current or past environmental conditions. I'm sure it can be accomplished in some manner; it just isn't described very well here.
Rating	good

Monitoring

If applicable, is monitoring appropriately designed (pre-post comparisons; treatment-control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Technical Review #1

Comments	
Rating	not applicable

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	CART analyses produce decision trees that are intuitively understood communication tools. Maps are probably even more powerful visual aids and the demand for distributed predictions with quantifiable accuracy is high. If the models work and the scenarios are incorporated effectively, this kind of information will likely provide very useful information easily digestible by other researchers, managers, and the lay public.
Rating	excellent

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	Dr. Ustin and her lab are as well qualified to tackle this project as any I know. She has a long history of past work studying coastal marshes and an established track record in the development of image analysis techniques for mapping marsh communities. The proposal exhibits sufficient familiarity with the physical characteristics of the marsh and the historical context of human activity during the study period.
Rating	

#0021: Environmental Influences on Key Species and Ecosystems in Suisun Marsh

Technical Review #1

	excellent
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Budget

Is the budget reasonable and adequate for the work proposed?

Comments	The budget is not very detailed, but it appears reasonable for 3 years of work and support of the required personnel. It is comparable to other proposals I have seen of this scope and type of analysis.
Rating	very good

Overall

Provide a brief explanation of your summary rating.

Comments	Overall, I rate the proposal as high quality in nearly all respects. It has many outstanding qualities and reflects a well-organized and considered study design. After reading it I feel confident that the work is worth doing and that the research team assembled will be able to carry it off.
Rating	very good

Technical Review #2

proposal title: Environmental Influences on Key Species and Ecosystems in Suisun Marsh

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	The goal to develop knowledge of how water use and management interacts with and affects plant community function and response, particularly in the Delta and Suisin Marsh is clearly stated. The proposed project does try to answer questions of how management actions affect the distribution of key plant species.
Rating	very good

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Comments	The project uses an established technique (Classification and Regression Tree) to develop a model to link management actions with habitat change based on existing databases. However, a clear understanding of the underlying conceptual model is not presented.
Rating	good

Technical Review #2

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	The approach has been used by the same team in upland situations and has worked there. I am not sure from this proposal if the team understands the dynamic nature of coastal marshes. For example, the proposal describes using salinity map information. Salinity in coastal marshes is extremely dynamic and affected by management actions, something that can not be derived from a map. The team should have known this since the site description for Suisun marsh mentions these types of salinity changes.
Rating	poor

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	The feasibility of the approach is compromised by the lack of the teams familiarity with dynamic coastal marshes. Future proposal should include someone with this experience.
Rating	poor

Monitoring

If applicable, is monitoring appropriately designed (pre–post comparisons; treatment–control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	Not applicable
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Technical Review #2

Rating	not applicable
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Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	The product from the proposed project should be a fully integrated GIS database for the two sites. Which could be of use. However, I suspect that the developed Classification and Regression Tree model will be as good as the data that goes into it and at the moment this needs to be better developed.
Rating	fair

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The proposed team lacks a trained wetland plant ecologist.
Rating	poor

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	Budget seems reasonable
Rating	good

Technical Review #2

Overall

Provide a brief explanation of your summary rating.

Comments	Overall this project did has what is in my eyes a fatal flaw. The team needs to be expanded with a wetland plant ecologist and the proposal should address how the CART technique operates with dynamic environmental and management data.
Rating	excellent

Technical Review #3

proposal title: Environmental Influences on Key Species and Ecosystems in Suisun Marsh

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	The objective of determining how water use and management affects plant communities in the Delta and Suisun marsh is clearly stated. The investigators propose to develop a model capable of predicting shifts in plant species composition due to altered hydrology, whether due to water management or other causes such as climate change. The hypotheses to be tested to achieve this goal are clearly stated. The idea could lead to important and useful results. The research is timely relative to the rapid development of remote sensing technology.
Rating	excellent

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Comments	The proposal includes a strong justification for the applicability of remote sensing and modeling techniques to the study of distribution of plant species in wetlands. Justification in terms of the value of results to management and society in general is not clearly stated. A research scale project is justified since the study would produce information of
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Technical Review #3

	value to the science of wetland plant ecology. It seems to me that predictions related to climate change are of little value since effects of weather pattern, water management and other human-induced changes in this manipulated system override the effects of climate change.
Rating	very good

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	<p>The approach is well designed and is likely to meet the objective, at least to some degree. The remote sensing technology and archived aerial photographs are likely to provide an accurate picture of changes in patterns of plant species over time. The more difficult task will be to directly correlate these changes in vegetation to specific management or hydrologic changes that occurred in the past. This is because of interaction of many environmental factors that control spatial distribution of wetland plant communities as well as introduction of exotic species.</p> <p>The study is likely to add to knowledge and information related to wetland plant ecology. The information generated by the research will be useful to managers and decision makers. For example it could improve management of hydrology, enhance growth of plant species that are valuable as food for waterfowl.</p>
Rating	very good

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success?

Technical Review #3

Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	The approach is technically feasible and exceptionally well documented by an extensive literature review. Success is highly likely due to the expertise of the investigators and the approach taken. The scale and scope of the project is well within the capabilities of the authors.
Rating	excellent

Monitoring

If applicable, is monitoring appropriately designed (pre–post comparisons; treatment–control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	The methods developed could be especially suited to long-term monitoring of changes in plant species distributions. The predictive model could be updated and improved as more data is collected.
Rating	excellent

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	The project is likely to produce results that are of value to wetland science and management. Remote sensing techniques and the predictive model may be applicable at locations other than the site of the study.
Rating	very good

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The investigators are experienced and highly qualified to successfully accomplish the proposed research.
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	The three-year budget is reasonable for the scope of the project.
Rating	very good

Overall

Provide a brief explanation of your summary rating.

Comments	The proposal is very well written and documented with references, the investigators are well qualified, the proposed research is scientifically sound, and it is likely that useful scientific and management information will be produced. The global climate change connection is weak since changes in management could mask climate change effects for many years; however, the model could produce predicted effects of climate change scenarios. The proposed research is interesting and has scientific value. The decision to fund at the level depends on priorities of CALFED.
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Technical Review #3

Rating	excellent
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